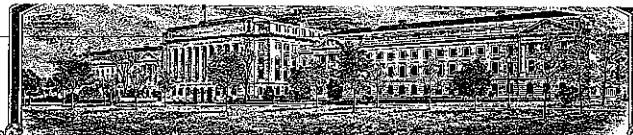


No.

200300182



# THE UNITED STATES OF AMERICA

TO ALL TO WHOM THESE PRESENTS SHALL COME:

## Montana Agricultural Experiment Station

WITNESSETH, THERE HAS BEEN PRESENTED TO THE

Secretary of Agriculture

AN APPLICATION REQUESTING A CERTIFICATE OF PROTECTION FOR AN ALLEGED DISTINCT VARIETY OF SEXUALLY REPRODUCED, OR TUBER PROPAGATED PLANT, THE NAME AND DESCRIPTION OF WHICH ARE CONTAINED IN THE APPLICATION AND EXHIBITS, A COPY OF WHICH IS HEREUNTO ANNEXED AND MADE A PART HEREOF, AND THE VARIOUS REQUIREMENTS OF LAW IN SUCH CASES MADE AND PROVIDED HAVE BEEN COMPLIED WITH, AND THE TITLE THERETO IS, FROM THE RECORDS OF THE PLANT VARIETY PROTECTION OFFICE, IN THE APPLICANT(S) INDICATED IN THE SAID COPY, AND WHEREAS, UPON DUE EXAMINATION MADE, THE SAID APPLICANT(S) IS (ARE) ADJUDGED TO BE ENTITLED TO A CERTIFICATE OF PLANT VARIETY PROTECTION UNDER THE LAW.

NOW, THEREFORE, THIS CERTIFICATE OF PLANT VARIETY PROTECTION IS TO GRANT UNTO THE SAID APPLICANT(S) AND THE SUCCESSORS, HEIRS OR ASSIGNS OF THE SAID APPLICANT(S) FOR THE TERM OF TWENTY YEARS FROM THE DATE OF THIS GRANT, SUBJECT TO THE PAYMENT OF THE REQUIRED FEES AND PERIODIC REPLENISHMENT OF Viable BASIC SEED OF THE VARIETY IN A PUBLIC REPOSITORY AS PROVIDED BY LAW, THE RIGHT TO EXCLUDE OTHERS FROM SELLING THE VARIETY, OR OFFERING IT FOR SALE, OR REPRODUCING IT, OR IMPORTING IT, OR EXPORTING IT, OR CONDITIONING IT FOR PROPAGATION, OR STOCKING IT FOR ANY OF THE ABOVE PURPOSE, OR CONDITIONING IT FOR PROPAGATION, OR STOCKING IT FOR ANY OF THE ABOVE PURPOSE, OR USING IT IN PRODUCING A HYBRID OR OTHER VARIETY THEREFROM, TO THE EXTENT PROVIDED BY THE PLANT VARIETY PROTECTION ACT. IN THE UNITED STATES SEED OF THIS VARIETY (1) SHALL BE SOLD BY VARIETY NAME ONLY AS A CLASS OF CERTIFIED SEEDS WHICH SHALL CONFORM TO THE NUMBER OF GENERATIONS SPECIFIED BY THE OWNER OF THE RIGHTS. (84 STAT. 1542 AS AMENDED, 7 U.S.C. 2321 ET SEQ.)

WHEAT, COMMON

'Explorer'

In Testimony Whereof, I have hereunto set my hand  
and caused the seal of the Plant Variety  
Protection Office to be affixed at the City of  
Washington, D.C. this twenty-fifth day of  
November, in the year two thousand and three.

Attest:

Thomas A. Salt

Acting Commissioner  
Plant Variety Protection Office  
Agricultural Marketing Service

Arthur C. Young  
Secretary of Agriculture

U.S. DEPARTMENT OF AGRICULTURE  
AGRICULTURAL MARKETING SERVICE  
SCIENCE AND TECHNOLOGY - PLANT VARIETY PROTECTION OFFICE

**APPLICATION FOR PLANT VARIETY PROTECTION CERTIFICATE**  
(Instructions and information collection burden statement on reverse)

The following statements are made in accordance with the Privacy Act of 1974 (5 U.S.C. 552a) and the Paperwork Reduction Act (PRA) of 1995.

Application is required in order to determine if a plant variety protection certificate is to be issued (7 U.S.C. 2421). Information is held confidential until certificate is issued (7 U.S.C. 2426).

1. NAME OF OWNER  Montana Agricultural Experiment Station		2. TEMPORARY DESIGNATION OR EXPERIMENTAL NAME  MTHW9710	3. VARIETY NAME  Explorer						
4. ADDRESS (Street and No., or R.F.D. No., City, State, and ZIP Code, and Country)  202 Linfield Hall Montana State University Bozeman, MT 59717		5. TELEPHONE (Include area code)  406-994-3683	6. FAX (Include area code)  406-994-6579						
7. IF THE OWNER NAMED IS NOT A "PERSON", GIVE FORM OF ORGANIZATION (corporation, partnership, association, etc.)  Experiment Station		8. IF INCORPORATED, GIVE STATE OF INCORPORATION	9. DATE OF INCORPORATION  3/12/2003						
10. NAME AND ADDRESS OF OWNER REPRESENTATIVE(S) TO SERVE IN THIS APPLICATION. (First person listed will receive all papers)  Luther Talbert Plant Sciences & Plant Pathology Department Montana State University Bozeman, MT 59717									
<table border="1"> <tr> <td>FEE S RECEIVED DATE 3/12/03</td> <td>FILING AND EXAMINATION FEES:  \$ 3652.00</td> </tr> <tr> <td></td> <td>CERTIFICATION FEE:  \$ 432.00</td> </tr> <tr> <td></td> <td>DATE 9/17/2003</td> </tr> </table>				FEE S RECEIVED DATE 3/12/03	FILING AND EXAMINATION FEES:  \$ 3652.00		CERTIFICATION FEE:  \$ 432.00		DATE 9/17/2003
FEE S RECEIVED DATE 3/12/03	FILING AND EXAMINATION FEES:  \$ 3652.00								
	CERTIFICATION FEE:  \$ 432.00								
	DATE 9/17/2003								
11. TELEPHONE (Include area code) 406-994-5060	12. FAX (Include area code) 406-994-1848	13. E_MAIL uss1t@montana.edu	14. CROP KIND (Common Name) wheat						
15. GENUS AND SPECIES NAME OF CROP Triticum aestinum		16. FAMILY NAME (Botanical) Triticeae	17. IS THE VARIETY A FIRST GENERATION HYBRID? <input type="checkbox"/> YES <input checked="" type="checkbox"/> NO						
18. CHECK APPROPRIATE BOX FOR EACH ATTACHMENT SUBMITTED (Follow instructions on reverse)		19. DOES THE OWNER SPECIFY THAT SEED OF THIS VARIETY BE SOLD AS A CLASS OF CERTIFIED SEED? See Section 83(a) of the Plant Variety Protection Act. <input checked="" type="checkbox"/> YES (If "yes", answer items 20 and 21 below) <input type="checkbox"/> NO (If "no," go to item 22)							
a. <input checked="" type="checkbox"/> Exhibit A. Origin and Breeding History of the Variety b. <input checked="" type="checkbox"/> Exhibit B. Statement of Distinctness c. <input checked="" type="checkbox"/> Exhibit C. Objective Description of Variety d. <input checked="" type="checkbox"/> Exhibit D. Additional Description of the Variety (Optional) e. <input checked="" type="checkbox"/> Exhibit E. Statement of the Basis of the Owner's Ownership f. <input type="checkbox"/> Voucher Sample (2,500 viable untreated seeds or, for tuber propagated varieties, verification that tissue culture will be deposited and maintained in an approved public repository) g. <input type="checkbox"/> Filing and Examination Fee (\$2,450), made payable to "Treasurer of the United States" (Mail to the Plant Variety Protection Office)		20. DOES THE OWNER SPECIFY THAT SEED OF THIS VARIETY BE LIMITED AS TO NUMBER OF GENERATIONS? <input checked="" type="checkbox"/> YES <input type="checkbox"/> NO							
		21. IF "YES" TO ITEM 20, WHICH CLASSES OF PRODUCTION BEYOND BREEDER SEED? <input checked="" type="checkbox"/> FOUNDATION <input checked="" type="checkbox"/> REGISTERED <input checked="" type="checkbox"/> CERTIFIED							
22. HAS THE VARIETY (INCLUDING ANY HARVESTED MATERIAL) OR A HYBRID PRODUCED FROM THIS VARIETY BEEN SOLD, DISPOSED OF, TRANSFERRED, OR USED IN THE U.S. OR OTHER COUNTRIES?  <input type="checkbox"/> YES <input checked="" type="checkbox"/> NO MAH 8/20/2003		23. IS THE VARIETY OR ANY COMPONENT OF THE VARIETY PROTECTED BY INTELLECTUAL PROPERTY RIGHT (PLANT BREEDER'S RIGHT OR PATENT)?  <input type="checkbox"/> YES <input checked="" type="checkbox"/> NO If YES, PLEASE GIVE COUNTRY, DATE OF FILING OR ISSUANCE AND ASSIGNED REFERENCE NUMBER. (Please use space indicated on reverse.)							
24. The owners declare that a viable sample of basic seed of the variety will be furnished with application and will be replenished upon request in accordance with such regulations as may be applicable, or for a tuber propagated variety a tissue culture will be deposited in a public repository and maintained for the duration of the certificate.									
The undersigned owner(s) is/are the owner of this sexually reproduced or tuber propagated plant variety, and believe(s) that the variety is new, distinct, uniform, and stable as required in Section 42, and is entitled to protection under the provisions of Section 42 of the Plant Variety Protection Act.									
Owner(s) is/are informed that false representation herein can jeopardize protection and result in penalties.									

SIGNATURE OF OWNER

NAME (Please print or type)

Sharron Quisenberry

SIGNATURE OF OWNER

NAME (Please print or type)

CAPACITY OR TITLE

Dean and Director

DATE

12/10/03

DATE

1

**PVP Application Section 18A-Origin and Breeding History**

'Explorer' (Reg. no. CV- 915, PI 619086) is a hard white spring wheat (*Triticum aestivum* L.) developed and released in May 2001 by the Montana Agricultural Experiment Station. Explorer provides a high protein hard white wheat with excellent baking quality to complement lower protein hard white wheats and the hard red spring wheat traditionally grown in the Great Plains of Montana. Explorer was an  $F_4$  plant selection from the cross MT8182/ 'Fortuna' (CI 13596)// 'Pondera' (CI 17828)/MT8182. MT8182 has hard white seed and was a selection from the variety 'Yding' ('CIANO F67'/'Penjamo T62'// 'Gallo'). Fortuna is solid-stemmed hard red spring wheat, and Pondera is a hollow-stemmed hard red spring wheat. Single seed descent was used for advancement to the  $F_4$  generation, where plants were selected primarily for height, head type, maturity and seed color for advancement to  $F_5$  rows.  $F_5$  rows were evaluated for the same characteristics along with uniformity, apparent yield potential, and kernel protein. Selected rows were advanced to a single row yield nursery in Bozeman in 1996, and evaluated for yield, other agronomic characters, and milling and baking quality. A selection from this nursery was designated MTHW9710. MTHW9710 was tested at five Montana locations from 1997-1999, and at ten Montana locations in 2000. Check varieties used for comparison were 'Hi-Line' (PI 549275) hard red spring wheat and 'MTHW9420' (PI 612605) hard white spring wheat. A head row/line row purification of MTHW9710, subsequently named Explorer, was commenced in 1998 by growing 400 head rows and discarding those that were non-uniform or differed from the modal type. Selected head rows were harvested separately, and grown as line rows in 1999. Aberrant line rows were discarded, and remaining line rows were harvested in bulk to form breeder seed of Explorer at the  $F_{10}$  generation.

Explorer has been observed to be uniform and stable over five generations of observation, with one exception. The exception is that an occurrence of 0.2% red seeds may be observed.

*These red kernel colored Seed are VARIANTS.*

per phone  
conversation  
matt 8/21/03

Explorer was released to the Montana Foundation Seed Program in 2001 for seed increase.

There have been no commercial seed sales to date.

Lesbock, K. L., W. B. Noble, and L. D. Shubbet. 1967. Registration of 'Fortuna' wheat. Crop Sci. 7:170.

McNeal, F. H. and D. L. Klindworth. 1980. Registration of 'Pondera' wheat. Crop Sci. 20:289.

**PVP Application Section 18B-Statement of Distinction**

Explorer is a hard white spring wheat with excellent milling and baking quality. Explorer has the pinB mutation for hard seed texture and has normal starch as opposed to partial waxy, based on the presence of functional alleles at all three waxy (GBSS) loci. Explorer differs from the majority of spring wheat varieties grown in the region due to having white kernels. Based on the Munsell Book of Colors, seed of Explorer had hue scores of 2.5 YR in each of three years of testing in Bozeman. This compares to scores of 5.0 YR for the hard red spring wheat cultivar 'McNeal'. Explorer is different from other hard white wheat varieties in that it has intermediate levels of stem solidness. Explorer had an average stem-solidness value over six trials of 11.6,

1 while hollow-stemmed MTHW9420 had a value of 8.1. These numbers are based on a scoring  
2 system of 5-25, where 5 is hollow and 25 is completely solid. The difference between Explorer  
3 and MTHW9420 was significant at P=0.01 (T-paired value of 3.5) based on a two-tailed paired t-  
4 test.

5  
6 Explorer is most similar to MTHW9420 as both are semi-dwarf and both have hard white  
7 kernels. The most easily discernable difference is that Explorer has semi-solid stems, while  
8 MTHW9420 is hollow-stemmed. Additionally, Explorer has averaged 14.7% grain protein  
9 versus 13.9% for MTHW9420 over 34 location/years of data (Table 8 in Exhibit D). This  
10 difference is significant based on a paired t-test at P < .001.

11  
12 Explorer is resistant to stem rust (see Exhibit C) based on a lack of symptoms observed after  
13 artificial inoculation in four independent nurseries using spores collected from epidemics in  
14 Eastern Montana. The race composition of the spores is not known. Explorer is inferred to be  
15 moderately resistant to the wheat stem sawfly based on its intermediate level of stem solidness  
16 observed at six locations.

17  
18

**REPRODUCE LOCALLY.** Include form number and date on all reproductions.

Public reporting burden for this collection of information is estimated to be 30 minutes per response, including the time for reviewing instructions needed, and completing and reviewing the collection of information, and comments regarding this burden estimate or any other aspect of the burden, to Department of Agriculture, Clearance Officer, OFRM, AG Box 7630, Jamie L. Whitten Building, Washington, D.C. 20250. When replying, refer to OMB No. 0581-0055 and form number in your letter. Under the PRA of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

The U.S. Department of Agriculture (USDA) prohibits discrimination in its programs on the basis of race, color, national origin, sex, religion, age, disability, political beliefs, and marital or familial status. (Not all prohibited bases apply to all programs). Persons with disabilities who require alternative means for communication of program information (braille, large print, audiotape, etc.) should contact the USDA Office of Communications at (202) 720-2791. To file a complaint, write the Secretary of Agriculture, U.S. Department of Agriculture, Washington, D.C. 20250, or call (202) 720-7327 (voice) or (202) 720-1127 (TDD). USDA is an equal opportunity employer.

searching existing data sources, gathering and maintaining the selection of information, including suggestions for reducing this

**U.S. DEPARTMENT OF AGRICULTURE  
AGRICULTURAL MARKETING SERVICE  
SCIENCE AND TECHNOLOGY  
PLANT VARIETY PROTECTION OFFICE  
BELTSVILLE, MD 20705**

**EXHIBIT C  
(Wheat)**

**OBJECTIVE DESCRIPTION OF VARIETY  
WHEAT (*Triticum* spp.)**

<b>NAME OF APPLICANT(S)</b> Montana Agricultural Experiment Station	<b>FOR OFFICIAL USE ONLY</b>
<b>ADDRESS (Street and No. or RD No., City, State, and Zip Code)</b> 202 Linfield Hall Montana State University Bozeman, MT 59717	<b>FVPO NUMBER</b> <b>200300182</b>
	<b>VARIETY NAME</b> <b>EXPLORER</b>
	<b>TEMPORARY OR EXPERIMENTAL DESIGNATION</b> <b>MTHW9710</b>

**PLEASE READ ALL INSTRUCTIONS CAREFULLY:** Place the appropriate number that describes the varietal character of this variety in the boxes below. Place a zero in the first box (e.g. **0 9 9** or **0 9**) when number is either 99 or less or 9 or less respectively. Data for quantitative plant characters should be based on a minimum of 100 plants. Comparative data should be determined from varieties entered in the same trial. Royal Horticultural Society or any recognized color standard may be used to determine plant colors; designate system used:  
Please answer all questions for your variety; lack of response may delay progress of your application.

**1. KIND:** 1

1=Common

2=Durum

3=Club

4=Other (SPECIFY): \_\_\_\_\_

**2. VERNALIZATION:** 1

1=Spring

2=Winter

3=Other (SPECIFY): \_\_\_\_\_

**3. COLEOPTILE ANTHOCYANIN:** 1

1=Absent

2=Present

**4. JUVENILE PLANT GROWTH:** 3

1=Prostrate

2=Semi-erect

3=Erect

**5. PLANT COLOR (boot stage):** 2

1 = Yellow-Green

2 = Green

3 = Blue-Green

**6. FLAG LEAF (boot stage):** 1

1 = Erect

2 = Recurved

1 = Not Twisted

2 = Twisted

**7. EAR EMERGENCE:** 2

Number of Days Earlier Than MTHW9420

 2

Number of Days Later Than KLASIC

## 8. ANTER COLOR:

200300182

 1

1 = Yellow

2 = Purple

## 9. PLANT HEIGHT (from soil to top of head, excluding awns):

 1     8

cm Taller Than KLASIC

 0

cm Shorter Than MTHW9420

\* Relative to a PVPO-Approved Commercial Variety Grown in the Same Trial

## 10. STEM:

## A. ANTHOCYANIN

 1

1=Absent

2=Present

## D. INTERNODE (SPECIFY NUMBER)

 2

1= Hollow

2=Semi-solid

3=Solid

## B. WAXY BLOOM

 1

1=Absent

2=Present

## E. PEDUNCLE

 2

1=Absent

2=Present

## C. HAIRINESS (last internode of rachis)

 30

cm Length

## 11. HEAD (at Maturity):

## A. DENSITY

 2

1=Lax

2=Middense

3=Dense

## C. CURVATURE

 2

1 = Erect

2 = Inclined

3 = Recurved

## B. SHAPE

## D. AWNEDNESS

 1

1 = Tapering

2 = Strap

3 = Clavate

4 = Other (SPECIFY):

 4

1 = Awnless

2 = Apically Awnletted

3 = Awnletted

4 = Awned

## 12. GLUMES (at Maturity):

## A. COLOR

## C. BEAK

 1

1 = White

2 = Tan

 3

1 = Obtuse

2 = Acute

3 = Acuminate

3 = Other (SPECIFY): primarily white w/  
tan striations on edges  
and types of glumes

## B. SHOULDER

## D. LENGTH

 2

1 = Wanting

2 = Oblique

3 = Rounded

4 = Square

5 = Elevated

6 = Apiculate

 3

1 = Short

2 = Medium

(ca. 7mm)

(ca. 8mm)

3 = Long (ca. 9mm)

## E. WDTTH

- 1 = Narrow (ca. 3mm)    2 = Medium (ca. 3.5mm)  
 3 = Wide (ca. 4mm)

## 13. SEED:

## A. SHAPE

- 1 = Ovate    2 = Oval    3 = Elliptical

## C. BRUSH

- 2 = Short    2 = Medium    3 = Long  
 2 = Not Collared    2 = Collared

## B. CHEEK

- 2 = Rounded    2 = Angular

## D. CREASE

- 2 = Width 60% or less of Kernel  
 2 = Width 80% or less of Kernel  
 3 = Width Nearly as Wide as Kernel

## E. Color

- 1 = White    2 = Amber    3 = Red  
 4 = OTHER (Specify)

G. PHENOL REACTION (*see instructions*):

- 0 = Ivory    2 = Fawn  
 3 = Light Brown    4 = Dark Brown  
 5 = Black

## F. TEXTURE

- 1 = Hard    2 = Soft

## 14. DISEASE: (0=Not Tested; 1=Susceptible; 2=Resistant; 3=Intermediate; 4=Tolerant)

PLEASE INDICATE THE SPECIFIC RACE OR STRAIN TESTED

2 = Stem Rust (*Puccinia graminis f. sp. tritici*)     0 = Leaf Rust (*Puccinia recondita f. sp. tritici*)

0 = Stripe Rust (*Puccinia striiformis*)     0 = Loose Smut (*Ustilago tritici*)

0 = Tan Spot (*Pyrenophora tritici-repentis*)     0 = Flag Smut (*Urocystis agropyri*)

0 = Halo Spot (*Selenophoma donacis*)     0 = Common Bunt (*Tilletia tritici* or *T. laevis*)

1 = *Septoria nodorum* (Glume Blotch)     0 = Dwarf Bunt (*Tilletia controversa*)

0 = *Septoria avenae* (Speckled Leaf Disease)     0 = Karnal Bunt (*Tilletia indica*)

0 = *Septoria tritici* (Speckled Leaf Blotch)     0 = Powdery Mildew (*Erysiphe graminis f. sp. tritici*)

0 = Scab (*Fusarium spp.*)     0 = "Snow Molds"

14.

## Disease (Continued)

(0=Not Tested; 1=Susceptible; 2=Resistant; 3=Intermediate; 4=Tolerant)

## PLEASE INDICATE THE SPECIFIC RACE OR STRAIN TESTED

- |                                       |  |                            |  |
|---------------------------------------|--|----------------------------|--|
| <input checked="" type="checkbox"/> 0 | "Black Point" (Kernel Smudge)              | <input type="checkbox"/> 0 | Common Root Rot ( <i>Fusarium, Cochliobolus</i> and <i>Bipolaris</i> spp.) |
| <input type="checkbox"/> 0            | Barley Yellow Dwarf Virus (BYDV)           | <input type="checkbox"/> 0 | Rhizoctonia Root Rot ( <i>Rhizoctonia solani</i> )                         |
| <input type="checkbox"/> 0            | Soilborne Mosaic Virus (SBMV)              | <input type="checkbox"/> 0 | Black Chaff ( <i>Xanthomonas campestris</i> pv. <i>translucens</i> )       |
| <input type="checkbox"/> 0            | Wheat Yellow (Spindle Streak) Mosaic Virus | <input type="checkbox"/> 0 | Bacterial Leaf Blight ( <i>Pseudomonas syringae</i> pv. <i>syringae</i> )  |
| <input checked="" type="checkbox"/> 1 | Wheat Streak Mosaic Virus (WSMV)           | <input type="checkbox"/>   | Other (SPECIFY)  |
| <input type="checkbox"/>              | Other (SPECIFY)                            | <input type="checkbox"/>   | Other (SPECIFY)  |
| <input type="checkbox"/>              | Other (SPECIFY)                            | <input type="checkbox"/>   | Other (SPECIFY)  |
| <input type="checkbox"/>              | Other (SPECIFY)                            | <input type="checkbox"/>   | Other (SPECIFY)  |

15. INSECT: (0=Not Tested; 1=Susceptible; 2=Resistant; 3=Intermediate; 4=Tolerant)

## PLEASE SPECIFY BIOTYPE (where needed)

- |                                       |   |                          |                 |
|---------------------------------------|---|--------------------------|-----------------|
| <input type="checkbox"/> 0            | Hessian Fly ( <i>Mayetiola destructor</i> )   | <input type="checkbox"/> | Other (SPECIFY) |
| <input checked="" type="checkbox"/> 3 | Stem Sawfly ( <i>Cephus</i> spp.)             | <input type="checkbox"/> | Other (SPECIFY) |
| <input type="checkbox"/> 0            | Cereal Leaf Beetle ( <i>Oulema melanopa</i> ) | <input type="checkbox"/> | Other (SPECIFY) |
| <input checked="" type="checkbox"/> 1 | Russian Aphid ( <i>Diuraphis noxia</i> )      | <input type="checkbox"/> | Other (SPECIFY) |
| <input type="checkbox"/> 0            | Greenbug ( <i>Schizaphis graminum</i> )       | <input type="checkbox"/> | Other (SPECIFY) |
| <input type="checkbox"/> 0            | Aphids  | <input type="checkbox"/> | Other (SPECIFY) |

16. ADDITIONAL INFORMATION ON ANY ITEM ABOVE, OR GENERAL COMMENTS

Explorer may contain 0.2% red seeds.

1      **PVP Application Section 18D-Additional Description of Variety**

2  
3      Tables 1-5 present the yearly means and over-all averages (1997-2000) while Table 8 shows the  
4      paired t-test results for yield, test weight, heading date, plant height, and grain protein for  
5      Explorer compared to other wheat varieties. Tables 6 and 7 contain milling, baking and noodle  
6      quality data means from seven location/years.

TABLE 1. 1997-2000 YIELD (bu/ac) SUMMARY FOR EXPLORER HARD WHITE SPRING WHEAT COMPARED TO HI-LINE AND OTHER WHEATS

200300182

ID	DISTRICT 1 KALISPELL					DISTRICT 2 BOZEMAN DRYLAND									
	1997	1998	1999	2000	YEARS AVERAGE	2000	YEARS AVERAGE	1997	1998	1999	2000	YEARS AVERAGE			
HI-LINE	26.3	89.0	116.2	120.9	4	88.1	67.7	1	67.7	86.6	94.3	93.3	87.3	4	90.4
MTHW9420	41.7	103.1	126.7	139.6	4	102.8	74.0	1	74.0	99.6	101.0	100.2	74.8	4	93.9
MTHW9701	49.4	92.5	114.3	119.7	4	94.0	76.8	1	76.8	102.8	100.7	97.4	89.7	4	97.7
EXPLORER	31.2	91.0	109.0	120.4	4	87.9	72.1	1	72.1	86.1	80.8	92.4	81.6	4	85.2
KLASIC	35.4	90.2	110.3	139.8	4	93.9	70.8	1	70.8	79.7	91.8	105.1	90.1	4	91.7

ID	DISTRICT 3 HUNTLEY DRYLAND					DISTRICT 4 MOCCASIN DRYLAND					DISTRICT 5 HAVRE DRYLAND				
	2000	YEARS	AVERAGE	2000	YEARS	AVERAGE	1999	YEARS	AVERAGE	1997	1998	1999	2000	YEARS	AVERAGE
HI-LINE	57.2	1	57.2	89.7	1	89.7	48.3	1	48.3	52.8	43.3	42.1	37.6	4	43.9
MTHW9420	47.4	1	47.4	85.7	1	85.7	45.4	1	45.4	48.2	39.3	37.7	38.7	4	41.0
MTHW9701	53.3	1	53.3	96.7	1	96.7	49.1	1	49.1	47.0	41.7	42.5	35.8	4	41.8
EXPLORER	55.5	1	55.5	83.9	1	83.9	55.1	1	55.1	50.8	41.4	42.3	41.6	4	44.0
KLASIC	58.9	1	58.9	79.4	1	79.4	57.7	1	57.7	47.9	36.0	47.0	36.7	4	41.9

ID	DISTRICT 5 CONRAD DRYLAND					DISTRICT 6 SIDNEY DRYLAND					DISTRICT 6 SIDNEY DRYLAND				
	1997	1998	1999	2000	YEARS AVERAGE	1997	1998	1999	2000	YEARS AVERAGE	1997	1998	1999	2000	YEARS AVERAGE
HI-LINE	69.5	72.2	55.0	39.1	4	58.9	36.7	60.1	49.1	54.1	4	50.0	87.6	1	87.6
MTHW9420	64.0	69.7	51.2	42.5	4	56.9	35.7	60.4	58.9	62.5	4	54.4	83.4	1	83.4
MTHW9701	70.1	70.2	64.4	45.0	4	62.4	30.6	56.3	59.0	55.5	4	50.3	95.3	1	95.3
EXPLORER	66.5	67.9	56.1	42.6	4	58.3	36.5	64.	57.5	54.9	4	53.3	83.5	1	83.5
KLASIC	55.5	65.4	55.1	32.4	4	52.1	22.9	50.8	47.0	56.4	4	44.3	75.3	1	75.3

TABLE 2. 1997-2000 TEST WEIGHT (LB/BU) SUMMARY FOR EXPLORER HARD WHITE SPRING WHEAT COMPARED TO HI-LINE AND OTHER WHEATS

ID	DISTRICT 1				DISTRICT 2			
	1997	1998	1999	2000	YEARS	YEARS	YEARS	YEARS
	KALISPELL				BOZEMAN DRYLAND			
	1997	1998	1999	2000	YEARS	YEARS	YEARS	YEARS
HI-LINE	59.6	61.6	62.9	4	61.8	59.8	1	59.8
MTHW9420	60.4	61.7	61.9	4	61.8	58.6	1	58.6
MTHW9701	58.0	61.6	61.6	4	60.9	59.6	1	59.6
EXPLORER	58.7	61.6	61.6	4	61.0	61.1	1	61.1
KLASIC	59.2	61.3	60.7	4	61.3	62.2	1	62.2

ID	DISTRICT 3				DISTRICT 4				DISTRICT 5			
	2000	YEARS	YEARS	YEARS	1999	YEARS	YEARS	YEARS	1998	1999	2000	YEARS
	HUNTLEY	DRYLAND	IRRIGATED		HUNTLEY	DRYLAND	IRRIGATED		HAVRE	DRYLAND	IRRIGATED	
	2000	YEARS	YEARS	YEARS	1999	YEARS	YEARS	YEARS	1998	1999	2000	YEARS
HI-LINE	57.8	1	57.8	61.1	1	61.1	56.0	1	56.0	58.9	61.6	56.9
MTHW9420	59.5	1	59.5	61.1	1	61.1	55.1	1	55.1	57.3	59.9	54.4
MTHW9701	58.6	1	58.6	58.8	1	58.8	57.2	1	57.2	57.5	59.8	56.1
EXPLORER	58.8	1	58.8	60.1	1	60.1	58.4	1	58.4	58.5	60.6	57.1
KLASIC	59.7	1	59.7	62.8	1	62.8	56.2	1	56.2	58.2	62.6	56.2

ID	DISTRICT 5				DISTRICT 6			
	1997	1998	1999	2000	YEARS	YEARS	YEARS	YEARS
	CONRAD	DRYLAND	IRRIGATED		SIDNEY	DRYLAND	IRRIGATED	
	1997	1998	1999	2000	YEARS	YEARS	YEARS	YEARS
HI-LINE	64.0	58.2	59.8	58.7	4	60.2	59.3	60.3
MTHW9420	61.7	59.5	60.4	58.3	4	60.0	59.7	58.5
MTHW9701	60.5	57.7	61.4	57.1	4	59.2	59.6	58.5
EXPLORER	62.2	60.8	60.7	58.8	4	60.6	59.5	60.8
KLASIC	62.5	59.3	61.2	58.9	4	60.5	60.9	61.0

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TABLE 3. 1997-2000 HEADING DATE (JULIAN DAYS) SUMMARY FOR EXPLORER HARD WHITE SPRING WHEAT COMPARED TO HI-LINE AND OTHER WHEATS

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ID	DISTRICT 1				DISTRICT 2				DISTRICT 2						
	1997	1998	1999	2000	YEARS	KALISPELL	BOZEMAN	DRYLAND	1997	1998	1999	2000	YEARS	IRRIGATED	AVERAGE
HI-LINE	183	169	172	171	4	174	175	1	175	188	184	179	176	4	182
MTHW9420	184	168	172	170	4	174	177	1	177	186	184	182	176	4	182
MTHW9701	186	168	172	171	4	175	177	1	177	187	185	181	178	4	183
EXPLORER	184	165	169	168	4	172	174	1	174	185	180	179	174	4	180
KLASIC	181	164	168	163	4	169	172	1	172	181	180	177	172	4	178

ID	DISTRICT 3				DISTRICT 4				DISTRICT 5						
	2000	YEARS	AVERAGE	HUNTLEY	DRYLAND	IRRIGATED	1999	YEARS	MOCCASIN	DRYLAND	1997	1998	1999	2000	YEARS
HI-LINE	162	1	162	158	1	158	183	1	183	174	174	178	173	4	175
MTHW9420	162	1	162	158	1	158	185	1	185	175	174	178	173	4	175
MTHW9701	162	1	162	159	1	159	183	1	183	176	175	179	175	4	176
EXPLORER	160	1	160	156	1	156	180	1	180	172	172	178	172	4	174
KLASIC	158	1	158	155	1	155	179	1	179	171	172	180	171	4	173

ID	DISTRICT 5				DISTRICT 6				DISTRICT 6						
	1997	1998	1999	2000	YEARS	AVERAGE	1997	1998	1999	2000	YEARS	AVG	1997	1998	1999
HI-LINE	188	174	181	177	4	180	168	169	170	164	4	168	160	1	160
MTHW9420	188	175	182	178	4	181	167	167	169	163	4	167	161	1	161
MTHW9701	188	176	182	178	4	181	169	168	170	164	4	168	161	1	161
EXPLORER	188	174	180	177	4	180	166	168	162	162	4	166	160	1	160
KLASIC	186	172	179	173	4	178	164	165	165	160	4	163	158	1	158

TABLE 4. 1997-2000 PLANT HEIGHT (INCHES) SUMMARY FOR EXPLORER HARD WHITE SPRING WHEAT COMPARED TO HI-LINE AND OTHER WHEATS

ID	DISTRICT 1				DISTRICT 2				DISTRICT 2			
	1997	1998	1999	2000	YEARS	AVERAGE	1997	1998	1999	2000	YEARS	AVERAGE
HI-LINE	24.8	31.8	36.2	30.4	4	31	33.4	1	33.4	32.2	33.3	35.4
MTHW9420	26.5	32.2	37.0	31.4	4	32	34.9	1	34.9	34.5	33.8	35.9
MTHW9701	26.2	32.7	34.4	27.1	4	30	33.6	1	33.6	32.4	32.0	33.4
EXPLORER	27.8	32.3	35.0	31.5	4	32	32.1	1	32.1	33.1	32.5	34.0
KLASIC	22.8	26.1	25.6	21.3	4	24	25.0	1	25.0	25.4	27.5	28.2

ID	DISTRICT 3				DISTRICT 4				DISTRICT 5			
	2000	YEARS	DRYLAND	IRRIGATED	1999	YEARS	DRYLAND	IRRIGATED	1999	2000	YEARS	AVERAGE
HI-LINE	28.2	1	28.2	30.9	1	30.9	31.3	1	31.3	24.5	28.7	29.5
MTHW9420	27.4	1	27.4	28.8	1	28.8	31.0	1	31.0	24.3	26.8	30.6
MTHW9701	26.8	1	26.8	31.2	1	31.2	30.3	1	30.3	24.2	25.9	30.1
EXPLORER	28.3	1	28.3	28.9	1	28.9	33.0	1	33.0	25.6	25.0	32.4
KLASIC	21.6	1	21.6	20.3	1	20.3	24.0	1	24.0	17.1	20.9	20.2

ID	DISTRICT 5				DISTRICT 6				DISTRICT 6			
	1997	1998	1999	2000	YEARS	AVERAGE	1997	1998	1999	2000	YEARS	AVERAGE
HI-LINE	34.0	31.7	32.0	27.0	4	31.2	18.0	31.4	30.2	27.3	4	26.7
MTHW9420	30.0	33.0	32.0	29.0	4	31.0	17.2	29.4	32.0	26.8	4	26.4
MTHW9701	32.0	33.0	32.0	28.0	4	31.3	17.1	29.1	29.9	25.4	4	25.4
EXPLORER	30.0	34.0	31.0	29.0	4	31.0	18.0	31.2	32.6	27.4	4	27.3
KLASIC	25.0	26.7	24.0	21.0	4	24.2	15.4	24.2	24.4	21.2	4	21.3

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TABLE 5. 1997-2000 GRAIN PROTEIN (%) SUMMARY FOR EXPLORER HARD WHITE SPRING WHEAT COMPARED TO HI-LINE AND OTHER WHEATS

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ID	DISTRICT 1				DISTRICT 2				DISTRICT 2						
	1997	1998	1999	2000	YEARS	AVERAGE	2000	YEARS	AVERAGE	1997	1998	1999	2000	YEARS	AVERAGE
HI-LINE	13.0	13.8	13.30	15.5	4	13.9	15.70	1	15.70	14.8	14.1	13.6	14.5	4	14.30
MTHW9420	12.1	12.5	12.80	13.2	4	12.7	14.10	1	14.10	14.3	14.3	12.5	12.9	4	13.50
MTHW9701	12.1	12.5	12.40	13.1	4	12.5	14.00	1	14.00	13.6	13.2	12.3	13.2	4	13.10
EXPLORER	13.5	14.8	14.40	14.9	4	14.4	14.50	1	14.50	15.4	14.6	13.6	14.3	4	14.50
KLASIC	11.2	13.1	13.00	13.8	4	12.8	14.70	1	14.70	16.2	13.7	12.6	13.7	4	14.00

ID	DISTRICT 3				DISTRICT 4				DISTRICT 5				DISTRICT 6			
	2000	YEARS	AVERAGE	2000	YEARS	AVERAGE	1999	YEARS	AVERAGE	1997	1998	1999	2000	YEARS	AVERAGE	
HI-LINE	17.7	1	17.7	13.8	1	13.8	16.2	1	16.2	13.90	15.9	15.30	17.9	4	15.8	
MTHW9420	17.1	1	17.1	13.4	1	13.4	15.6	1	15.6	14.10	14.9	13.40	15.1	4	14.4	
MTHW9701	16.3	1	16.3	14.5	1	14.5	15.0	1	15.0	14.00	14.5	14.50	14.6	4	14.4	
EXPLORER	16.9	1	16.9	12.6	1	14.6	15.2	1	15.2	13.90	14.8	15.00	16.8	4	15.1	
KLASIC	15.6	1	15.6	12.4	1	12.4	15.0	1	15.0	13.60	16.5	13.10	14.9	4	14.5	

ID	DISTRICT 5				DISTRICT 6				DISTRICT 6						
	1997	1998	1999	2000	YEARS	AVERAGE	1997	1998	1999	2000	YEARS	AVERAGE			
HI-LINE	12.9	11.4	12.20	15.3	4	13.0	16.1	14.2	12.2	13.6	4	14.0	14.9	1	14.9
MTHW9420	12.3	12	10.80	13.6	4	12.2	15.6	14.4	11.0	11.6	4	13.2	13.4	1	13.4
MTHW9701	11.6	12.1	10.70	13.7	4	12.0	15.4	13.8	11.5	12.2	4	13.2	13.1	1	13.1
EXPLORER	12.9	12	12.00	14.2	4	12.6	15.9	15.2	12.7	13.1	4	14.2	15.2	1	15.2
KLASIC	12.8	12	11.20	14.2	4	12.6	17.9	15.9	11.5	12.4	4	14.4	13.1	1	13.1

TABLE 6. 1997-1999 MILLING AND BAKING QUALITY SUMMARY FOR EXPLORER HARD WHITE SPRING WHEATS COMPARED TO HI-LINE AND OTHER WHEATS (7 LOCATION AVERAGE)

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ID	Wheat Protein %		Flour Yield %		Flour Protein %		Flour Ash %	Tolerance (1=poor, 10=very strong)	Mixograph mix time (min.) 1997 1998   1999
	1997	1998	1997	1998	1999	1997	1998	1999	
Hi-line	14.4	15.0	13.7	64.0	63.6	62.5	12.9	13.4	12.0   0.38 0.43 5.0   6.0   4.3   3.7   4.9
MTHW9420	14.2	14.6	12.2	65.4	67.2	66.0	12.4	12.9	10.7   0.43 0.49 4.0   4.0   3.1   2.9   3.3
MTHW9701	13.8	13.9	12.5	63.9	63.9	63.8	12.1	12.4	10.7   0.44 0.49 3.0   3.0   4.1   4.5   5.3
EXPLORER	14.7	14.7	13.5	65.9	64.8	64.1	13.4	13.6	12.1   0.45 0.49 6.0   6.0   5.0   3.4   3.5
KLASIC	14.9	15.1	12.3	64.5	68.2	64.7	13.1	13.5	10.9   0.37 0.40 5.0   5.0   5.0   4.8   5.6

ID	Mixograph absorption (%)		Bake mix time (min.)		Water Absorption, %		Loaf Volume (cc.) 1997 1998   1999	Crumb Grain Score 1997 1998   1999
	1997	1998	1999	1997	1998	1999		
Hi-line	62.5	64.4	59.9	6.2	6	9.6	68.2   74.2 73.6   1205 1295   1075   4   3   3	
MTHW9420	60.7	62.4	59.8	3.6	3.8	5.3	66.5   72.2 70.2   1055 1110   947   3   4   3	
MTHW9701	59.4	62.5	56.7	5.3	6.6	6.5	67.1   72.2 67.4   1003 1033   872   3   3   3	
EXPLORER	63.9	65.0	61.2	4.0	5.3	6.4	69.4   74.7 72.5   1228 1265   1087   3   3   3	
KLASIC	59.6	63.9	57.1	5.1	8.2	10.9	64.3   74.7 68.6   1198 1233   1053   3   3   2	

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TABLE 7. 1997-1999 NOODLE QUALITY SUMMARY FOR EXPLORER HARD WHITE SPRING WHEATS COMPARED TO HI-LINE AND OTHER WHEATS (7 LOCATION AVERAGES)

ID	Noodle color - L 0 hr.		Noodle Color - L 2 hr.		Noodle Color - L 24 hr.		Noodle Color - b 0 hr.		Noodle Color - b 2 hr.		Noodle color - b 24 hr.	
	1997	1998	1997	1998	1997	1998	1997	1998	1997	1998	1997	1998
HI-LINE	87.3	86.2	84.9	83.9	82.1	80.4	78.8	76.6	74.6	71.7	15.2	15.0
MTHW9420	88.1	87.1	86.7	85.0	83.9	82.7	81.0	79.3	77.2	12.3	15.9	15.7
MTHW9701	87.9	86.8	86.4	85.0	83.1	82.7	80.1	77.8	76.7	14.0	15.8	16.8
EXPLORER	86.8	85.8	85.8	83.8	81.9	81.1	81.5	81.9	78.1	75.1	15.3	17.6
KLASIC	86.5	86.1	86.1	82.9	81.5	81.3	81.3	76.6	74.6	12.9	13.1	16.5
APH <sup>1</sup>	85.1	86.1	86.1	82.4	82.5	82.5	82.4	80.2	77.0	15.0	13.7	17.7
NuWest				87.4			84.1				14.9	19.2
											18.7	21.1
											21.0	21.3

ID	Noodle Score		Cooking Yield		Springiness 0 min.		Springiness 5 min.		Adhesiveness 0 min.		Adhesiveness 5 min.	
	1997	1998	1997	1998	1997	1998	1997	1998	1997	1998	1997	1998
HI-LINE	286	260	301	n/a	95	110	0.81	0.83	0.92	0.83	0.86	0.82
MTHW9420	322	301	317	n/a	110	117	0.83	0.85	0.89	0.78	0.87	0.84
MTHW9701	343	264	313	n/a	107	108	0.74	0.84	0.88	0.80	0.79	0.80
EXPLORER	292	240	280	n/a	101	101	0.75	0.85	0.92	0.80	0.92	0.88
KLASIC	262	231	284	n/a	96	113	0.85	0.89	0.94	0.89	0.91	0.88
APH <sup>1</sup>	325	337	337	n/a	103	109	0.89	0.89	0.92	0.87	0.89	0.88
NuWest			351			126					0.8	
											-18	-44
											-15	-25
											-28	-37
											-28	-34
											-30	-30

ID	Cohesiveness 0 min.		Cohesiveness 5 min.		Chewiness 0 min.		Chewiness 5 min.		Hardness 0 min.		Hardness 5 min.	
	1997	1998	1997	1998	1997	1998	1997	1998	1997	1998	1997	1998
HI-LINE	0.56	0.57	0.55	0.58	0.55	0.51	0.51	0.52	0.53	0.56	0.57	0.57
MTHW9420	0.58	0.55	0.56	0.54	0.52	0.51	0.56	0.47	0.47	0.54	0.51	0.52
MTHW9701	0.52	0.50	0.52	0.52	0.51	0.54	0.54	0.57	0.52	0.51	0.51	0.52
EXPLORER	0.60	0.56	0.56	0.56	0.56	0.57	0.57	0.57	0.57	0.57	0.57	0.57
KLASIC	0.59	0.57	0.58	0.61	0.54	0.53	0.53	0.54	0.54	0.54	0.54	0.54
APH <sup>1</sup>	0.54	0.54	0.58	0.49	0.49	0.52	0.48	0.48	0.48	0.48	0.48	0.48
NuWest												

ID	Cooking tolerance			
	1997	1998	1999	1999
HI-LINE	97	348	346	
MTHW9420	139	333	288	
MTHW9701	58	293	341	
EXPLORER	126	338	322	
KLASIC	288	328	325	
APH <sup>1</sup>	331	339	339	
NuWest				

<sup>1</sup> Australian Premium Hard White Spring wheat used for comparison

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Table 8.  
PAIRED T-TEST RESULTS

GRAIN YIELD (BU/AC)  
REFERENCE MEAN: HI-LINE 64.4 (N= 35)

ID	ACTUAL MEAN	NO. OBS	MEAN DIFF	T-PAIRED VALUE	P-VALUE
MTHW9420	66.6	35	2.3	1.7	.104
EXPLORER	62.3	35	-2.0	-1.9	.065
KLASIC	63.4	35	-.9	-.6	.538

TEST WEIGHT (LB/BU)  
REFERENCE MEAN: HI-LINE 60.2 (N= 35)

ID	ACTUAL MEAN	NO. OBS	MEAN DIFF	T-PAIRED VALUE	P-VALUE
MTHW9420	59.8	35	-.5	-2.2	.034
EXPLORER	60.0	35	-.3	-1.3	.204
KLASIC	60.6	35	.4	2.0	.052

HEADING DATE (JULIAN DAYS; 173 = JUNE 22)  
REFERENCE MEAN: HI-LINE 173.4 (N= 35)

ID	ACTUAL MEAN	NO. OBS	MEAN DIFF	T-PAIRED VALUE	P-VALUE
MTHW9420	173.5	35	.1	.3	.762
EXPLORER	171.8	35	-1.6	-7.8	.000
KLASIC	170.3	35	-3.1	-10.4	.000

PLANT HEIGHT (INCHES)  
REFERENCE MEAN: HI-LINE 29.1 (N= 35)

ID	ACTUAL MEAN	NO. OBS	MEAN DIFF	T-PAIRED VALUE	P-VALUE
MTHW9420	29.1	35	.0	.2	.848
EXPLORER	29.0	35	-.1	-.3	.753
KLASIC	22.8	35	-6.3	-16.2	.000

GRAIN PROTEIN (INCHES) %  
REFERENCE MEAN: HI-LINE 14.9 (N= 34)

MAH  
8/20/2003

ID	ACTUAL MEAN	NO. OBS	MEAN DIFF	T-PAIRED VALUE	P-VALUE
MTHW9420	13.9	33	-1.0	-7.4	.000
EXPLORER	14.7	34	.2	1.5	.145
KLASIC	14.1	34	-.8	-3.9	.000

**EXHIBIT E**  
**STATEMENT OF THE BASIS OF OWNERSHIP**

**1. NAME OF APPLICANT(S)**

Montana Agricultural Experiment Station

**4. ADDRESS (Street and No., or R.F.D. No., City, State, and ZIP, and Country)**

202 Linfield Hall  
Montana State University  
Bozeman, MT 59717

**2. TEMPORARY DESIGNATION  
OR EXPERIMENTAL NUMBER**

MTHW9710

**3. VARIETY NAME**

Explorer

**8. Does the applicant own all rights to the variety? Mark an "X" in appropriate block. If no, please explain.**

YES

NO

**9. Is the applicant (individual or company) a U.S. national or U.S. based company?**

If no, give name of country

YES

NO

**10. Is the applicant the original owner?**

YES

NO

If no, please answer one of the following:

a. If original rights to variety were owned by individual(s), is (are) the original owner(s) a U.S. national(s)?

YES

NO

If no, give name of country

b. If original rights to variety were owned by a company(ies), is(are) the original owner(s) a U.S. based company?

YES

NO

If no, give name of country

**11. Additional explanation on ownership (if needed, use reverse for extra space):**

**PLEASE NOTE:**

Plant variety protection can be afforded only to owners (not licensees) who meet one of the following criteria:

1. If the rights to the variety are owned by the original breeder, that person must be a U.S. national, national of a UPOV member country, or national of a country which affords similar protection to nationals of the U.S. for the same genus and species.
2. If the rights to the variety are owned by the company which employed the original breeder(s), the company must be U.S. based, owned by nationals of a UPOV member country, or owned by nationals of a country which affords similar protection to nationals of the U.S. for the same genus and species.
3. If the applicant is an owner who is not the original owner, both the original owner and the applicant must meet one of the above criteria.

The original breeder/owner may be the individual or company who directed final breeding. See Section 41(a)(2) of the Plant Variety Protection Act for definition.

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